A novel non-invasive model to predict high-risk varices in cirrhotic patients

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Acute variceal bleeding is one of the most common and potentially life-threatening complications in patients with liver cirrhosis. It is conventionally diagnosed by oesophagogastroduodenoscopy, which is invasive to patients and carries hospital costs. It would be more cost-effective if non-invasive tests could screen out high-risk patients who developed acute variceal bleeding requiring endoscopic treatment. That can potentially reduce the need for invasive procedures for cirrhotic patients. In recent years, there have been advancements in non-invasive methods for assessing the risk of variceal bleeding. These include transient elastography (FibroScan) of the liver and spleen, platelet count, imaging modalities [ultrasound or magnetic resonance imaging (MRI)], and non-invasive liver function tests [Child-Pugh score or the Model for End-Stage Liver Disease (MELD) score]. The 2015 Baveno VI consensus is developed by an international panel of experts to improve the diagnosis and management of portal hypertension and its complications, specifically focusing on variceal bleeding in patients with cirrhosis (1). The consensus emphasizes using noninvasive methods to screen out high-risk varices (HRV) requiring therapeutic endoscopy. The key features of the Baveno VI criteria include a liver stiffness measurement (LSM) <20 kPa and a platelet count >150,000/mm^3. It can confidently rule out HRV. It has been proven to avoid unnecessary endoscopy up to 40% with a specificity of up to 46% (2). In recent years, spleen stiffness measurement (SSM) has been a useful tool to assess portal hypertension and to predict HRV. Hence, the revised Baveno VII consensus in 2022 recommends SSM ≤40 kPa would avoid more unnecessary endoscopy in patients who fall outside Baveno VI criteria, with a missed HRV rate of <5% (3).

The present study by Zhang *et al.* (4) validated the performance of the Baveno VII criteria in patients with HBV cirrhosis. In this study, which included 504 cirrhotic patients with hepatitis B viral (HBV) infection, the Baveno VII criteria, using a 50 Hz probe for SSM measurement, resulted in a higher rate of spared endoscopies compared to the Baveno VI criteria (56.7% *vs.* 39.1%). Importantly, the missed HRV rate with the Baveno VII criteria was comparable to that of the Baveno VI criteria (3.8% *vs.* 2.5%). Furthermore, the missed HRV rate of the Baveno VII criteria was lower than that of other models tested in the study, such as LSM-longitudinal spleen diameter to platelet ratio score (LSPS) (11.3%), platelet count/longitudinal spleen diameter ratio (PSR) (20%), and Rete Sicilia Selezione Terapia-hepatitis (RESIST) (8.8%). This prospective large cohort study demonstrated excellent performance of Baveno VII criteria. Additionally, when SSM was measured using a 100 Hz probe, the spared endoscopy rate increased to 75.4%, with a missed HRV rate of 3%. These findings suggested that the Baveno VII

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criteria, incorporating SSM measurement, demonstrated excellent performance in identifying high-risk varices and reducing the need for unnecessary endoscopies in patients with HBV cirrhosis. The study highlights the potential of SSM as a valuable tool in risk stratification for variceal bleeding.

❖ The incorporation of SSM into Baveno VII criteria needs further discussion. A recent systemic review has confirmed that SSM can accurately predict HVR (5). SSM <46 kPa can safely rule out HRV in cirrhotic patients who did not meet the Baveno VI criteria (2,6). Those studies used a liver-dedicated shear wave frequency (50 Hz). The findings from the present study (4) highlight the importance of considering different SSM cutoff values and probe frequencies in determining the optimal approach for HRV risk stratification. It was observed that using a 50 Hz probe and a conservative SSM cutoff value of <40 kPa in the Baveno VII criteria resulted in excellent performance in ruling out HRV, with a low missed HRV rate and a significant proportion of unnecessary endoscopies spared. This suggests that the Baveno VII criteria with the specific SSM cutoff value of <40 kPa using a 50 Hz probe may be a safe and effective approach for risk stratification. However, it was found that the combined model of Baveno VI criteria with SSM cutoff value <46 kPa was not as effective in ruling out HRVs, with a higher missed HRV rate compared to the Baveno VII criteria. This suggests that the specific SSM cutoff value used in conjunction with the Baveno VI criteria is crucial. Further research and validation studies in diverse patient populations and clinical settings will help refine and establish the optimal approach for incorporating SSM into the Baveno VII criteria. The novel 100 Hz probe in measuring SSM can better delineate spleen stiffness since it uses spleen-dedicated shear wave frequency. It has shown that SSM measured by 100 Hz probe could spare more endoscopy than those measured by 50 Hz probe when the cut-off value was set at 40.1 kPa at 50 Hz probe and 41.3 kPa at 100 Hz probe (7). The present study (4) also demonstrates the superiority of SSM measured by 100 Hz probe when compared to those measured by 50 Hx probe (spared endoscopy rate 75.4% *vs.* 59.5%). This echoes the results of other studies (7,8).

❖ Another highlight of the present study (4) is the comparison of different models in predicting HRV. Among these models (Baveno VII, LSPS, PSR and RESIST), Baveno VII can achieve the lowest rate of missing HRV (3.8%). One potential reason for the superior performance of the Baveno VII model could be the inclusion of SSM as a key feature. While the other models may not have incorporated SSM into their algorithms, Baveno VII specifically incorporates SSM measurements. This suggests that SSM could play a crucial role in accurately predicting HRV. The inclusion of SSM in the Baveno VII model may provide additional information about spleen stiffness, which is known to be associated with the presence of HRV. Further research and validation studies are needed to confirm SSM's significance and explore its potential synergistic effects with other parameters in predicting HRV accurately.

❖ Although the present study (4) showed excellent results of Baveno VII, it has a few limitations. The first limitation is the focus on patients with chronic HBV cirrhosis. Extending the study to include other etiologies of liver cirrhosis, such as HCV and fatty liver disease, would enhance the generalizability of the findings. Different etiologies may have unique characteristics and patterns of disease progression, so it is important to assess the performance of the Baveno VII criteria across various etiologies. The second limitation is that the study was cross-sectional. Conducting long-term follow-up studies would provide valuable insights into the time-dependent prediction power of the Baveno VII criteria. By assessing the performance of the criteria over an extended period, it would be possible to evaluate their ability to predict HRV risk and to determine if the results remain consistent over time. By addressing these limitations, future studies can provide a more robust evaluation of the Baveno VII criteria and their utility in different etiologies of liver cirrhosis. Long-term follow-up studies can offer insights into the dynamic nature of HRV risk and the predictive ability of the Baveno VII criteria over time.

These suggestions for future research will contribute to the ongoing refinement and validation of risk stratification models for HRV, ultimately improving clinical decision-making and patient outcomes.

❖ To conclude, Baveno VII criteria is probably the most accurate prediction model of HRV in cirrhotic patients. Its rate of sparing unnecessary endoscopy is the highest among different prediction models.

Footnote

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